Remarks:

This application has been reviewed carefully in view of the Office Action mailed January 25, 2006 ("the Office Action"). In the Office Action, claims 1-20 were rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Langford, III, U.S. Patent No. 5,106,035.

The above-described rejection is addressed as follows:

I. CLAIM REJECTIONS

The Office Action alleges that "[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to supply a gaseous reactant at a pressure less than one atmosphere, since it has been held that where the general conditions of a claim are disclose[d] in one prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233". (See, Para. 3 of the Office Action.)

Applicants respectfully traverse the examiner's assertion that it would have been obvious to supply gaseous reactant at a pressure less than one atmosphere. As will be discussed below, Langford, III clearly teaches away from the claimed invention, both explicitly and implicitly. More particularly, Langford, III explicitly teaches that high-pressures are required, and implicitly teaches away from the claimed invention because the claimed invention is antithetical to the use of the Langford, III device, as the use of low-pressure reactants makes unnecessary the very function of the Langford, III invention. Moreover, even after the priority date of the present application, those of skill in the art did not consider pressures of less than one atmosphere to be within the range of possibilities over which one would optimize fuel cell operation.

Claim 1 recites:

> ... a controller configured to regulate the reaction pressure of a reactant of the group consisting of the fuel and the oxidizer;

> wherein the controller is ***configured to regulate the reaction pressure to be less than one atmosphere*** with the aircraft at a cruise altitude and the fuel cell operating at the given power-generation rate.

Likewise, claim 17 recites:

> ... such that the fuel cell reacts oxygen at a first reaction pressure with hydrogen at a second reaction pressure, ***wherein the first reaction pressure is less than one atmosphere,*** and wherein the difference between the first reaction pressure and the second reaction pressure is no greater than a predetermined limit.

A prima facie case of obviousness may be rebut by showing that the art, in any material respect, teaches away from the claimed invention. M.P.E.P. § 2144.05 (Obviousness of Ranges), citing *In re Gisler*, 116 F.3d 1465, 1471, 43 U.S.P.Q. 1362, 1366 (Fed. Cir. 1997).

A) Langford, III Explicitly Teaches Away from the Claimed Invention

Langford, III recites that "[g]aseous hydrogen at approximately 20° F is injected into the fuel cell at approximately ***50 psi***. Oxidizer is also injected at similar conditions" (col. 4, lines 13-16, emphasis added). Langford, III further recites that "The fuel cell ***requires*** a gaseous oxidizer at a pressure ***far above ambient***" (col. 5, lines 47-48, emphasis added). Thus, even at low altitudes, the air is compressed in a compressor before being fed into the fuel cell (see, col. 6, lines 1-3). So, not only does Langford, III fail to disclose a reaction pressure being regulated to be less than one atmosphere with the aircraft at a cruise altitude, as is claimed in the current invention, but in fact, Langford, III explicitly **requires** an oxidizer to be supplied to a fuel cell at a pressure such as 50 psi, far above one atmosphere.

Since the explicitly recited "far above ambient," "50 psi" requirement is far above one atmosphere, and even further above ambient pressure at the high altitudes being considered, Langford, III teaches away from Applicants' reactant pressures. This is entirely in agreement with the fuel cell technology available to those skilled in the art at the time of the invention, in which reaction pressures required were well over one

atmosphere. It would not be obvious to optimize a normally pressurized system to pressures below one atmosphere.

B) Langford, III Implicitly Teaches Away from the Claimed Invention, in That the Claimed Invention Is Antithetical to the Langford, III Device

The Langford, III invention is based on the premise that "[t]he fundamental constraint in devising a propulsion system for a high-altitude flight in the earth's atmosphere is the rapid reduction in atmospheric density with altitude (see, col. 1, lines 45-48). Langford, III notes that not only do the low pressures at high-altitude makes it difficult to sustain the combustion process typically associated with aircraft propulsion devices (see, col. 1, lines 48-50), they also purportedly interfere with the operation of fuel cells, which require high compression ratios at cruise altitudes (see, col. 6, lines 39-40). Thus, the Langford, III invention is designed to overcome the perceived problem that at extremely high altitudes, an adequate compressor for a fuel cell would be prohibitively heavy and inefficient (see, col. 3, lines 35-37).

In response to this problem, the Langford, III device is configured to alternately fly at high altitude, where the air pressure is very low, and at low altitude, where the air pressure is much higher. The Langford, III device includes a compressor to pressurize and store atmospheric air while at the low altitude, and uses the pressurized and stored air (rather than high-altitude atmospheric air) during the high-altitude flight (see, e.g., col. 4, lines 19-23; col. 6, lines 54-56; or the Abstract). Doing so purportedly overcomes the need for compressing air from the low air pressures at extremely high altitudes, where the operation of a compressor adequate to achieve pressurization would be prohibitively heavy and inefficient (see, col. 3, lines 35-37).

In short, Langford, III is designed to supply high-pressure air to a fuel cell at high-altitude, without the use of compressors adequate to compress the ambient high-altitude air. Indeed, it is asserted that the Langford, III device could support the operating needs of an internal combustion engine (see, col. 5, lines 15-18), despite the fact that low pressures

at high-altitude makes it difficult to sustain the combustion process typically associated with aircraft propulsion devices (see, col. 1, lines 48-50).

Under the present invention, a fuel cell is designed to operate at pressures so low that either no compressor is needed, or the needed compressor is small and efficient, both from a perspective of weight and power usage. The use of such a device is antithetical to the use of a Langford, III device, as it entirely removes the purpose for using the Langford, III device (i.e., to provide high-pressure air to a fuel cell at high altitudes). Because the use of low-pressure reactants eliminates the need purportedly motivating one to use the Langford, III invention, it would not be obvious to a person skilled in the art to operate the Langford, III fuel cell at a low pressure level (i.e., below one atmosphere).

C) Those of Skill in the Art Did Not Consider Pressures of less than One Atmosphere to Be Within the Range of Possibilities Over Which One Would Optimize

Enclosed with this Amendment is an IDS delivering a paper from the Proceedings of the American Control Conference, Denver, Colorado, June 4-6, 2003, substantially after the priority date of the present application. This paper compares the dynamics of low-pressure and high-pressure fuel cell air supply systems, and contemplates their use in transportation technologies. In its selection of high- and low-pressure systems, it demonstrates well accepted views in the art on the range of pressures over which one might optimize performance.

To study the performance of a "low-pressure" system, the authors used a blower configured to blow air on a fuel cell stack. The blower raised the pressure only a limited amount (as compared to a compressor), and thus the reaction pressure was only a limited amount over atmospheric pressure (see, Sect. 2, last paragraph). Though their report was focused on considering the usability of low-pressure fuel cell stacks, the authors did not even discuss the possibility of pressures below one atmosphere. This serves as evidence that those of skill in the art, at the time the invention was made and filed, did not consider pressures of less than one atmosphere to be within the range of possibilities over which one would optimize performance.

D) It Would Not Have Been Obvious to Supply Gaseous Reactant at a Pressure less than One Atmosphere.

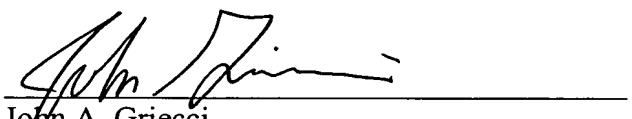
Because Langford, III teaches away from the claimed invention, both explicitly and implicitly, and because those of skill in the art would not consider pressures of less than one atmosphere to be within the range of possibilities over which one would optimize a fuel cell reaction pressure, the rejection under 35 U.S.C. § 103(a) of independent claims 1 and 17, and their dependent claims 2-16 and 18-20 respectively, is improper, and Applicants request it be withdrawn.

I. CONCLUSION

In view of the foregoing, Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

MACCREADY et al.

By: 

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